

PATENT ABSTRACTS OF JAPAN

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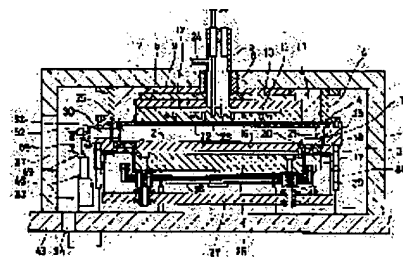
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(54) CVD DEVICE

(57)Abstract:

PURPOSE: To actually carry a substrate in and out of a plasma production chamber and to realize a CVD device having dual processing chamber structure:

CONSTITUTION: In the title CVD device of dual-chamber structure having a plasma production chamber in processing chamber, the plasma production chamber 25 is sectioned by providing an inner chamber 15 in the processing chamber 1; a carrying in and out hole opposing to the communication hole 37 and capable of opening and closing by a shutter 32 made in the processing chamber 1 is made in the inner chamber 15 to be opened and closed by the shutter 32; while in order to CVD-process the substrate 2, the carrying in and out hole is closed by the shutter 32 so as to section the plasma production chamber 25 almost in sealed up state while the substrate 2 is to be carried in and out by releasing the carrying in and out hole.



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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the CVD system which forms a thin film on the substrate which is one of the semiconductor fabrication machines and equipment.

[0002]

[Description of the Prior Art] There is a process which carries out necessary membrane formation to one of the manufacturing processes of semiconductor manufacture on a silicon-substrate front face, or forms membranes on a glass substrate to one of the production processes of a liquid crystal display.

[0003] This inserts a substrate in an airtight processing room, supplies reactant gas to the aforementioned processing interior of a room, generates plasma while it impresses RF power to inter-electrode [which was prepared in this processing interior of a room / one pair of], and it makes a substrate front face form a thin film (Chemical Vapor Deposition).

[0004] In the conventional CVD system, there was an electrode of the method of one by which the aforementioned substrate is installed in the 1st airtight page of the processing interior of a room, face to face was stood against this electrode, and the electrode was prepared in the field of airtight another side of the processing interior of a room, inter-electrode [these one pairs of] was made to generate plasma, and CVD processing was performed to it.

[0005] The aforementioned CVD processing decomposes the gas molecule of a gaseous phase, and is made to deposit it as a thin film on a substrate. However, a thin film forms membranes not only in a substrate top but in the electrode and processing indoor wall which stand face to face against a substrate. The membrane formation deposited on the electrode and the processing indoor wall exfoliates soon, adheres on the substrate under processing, and pollutes a substrate. If a substrate is polluted with the aforementioned sediment, the serious defect for membrane formation of a substrate will be produced. For this reason, the processing interior of a room was cleaned periodically conventionally.

[0006]

[Problem(s) to be Solved by the Invention] Cleaning had to be performed by decomposing a processing room, and work had required time while it was troublesome. Therefore, this cleaning had become the cause of reducing the rate of movable of equipment. Moreover, if plasma is generated in the limited space, it is known that uniform plasma will be acquired.

[0007] While forming the plasma generating room 3 further in the appearance which makes it generate in the space which contained the substrate 2 and limited ** plasma, and the processing room 1, carrying out as a double room, carrying out that cleaning of the aforementioned plasma generating room is possible and planning easy-ization of cleaning as shown in drawing 8 in order to solve this problem, the CVD system it was made to generate uniform plasma is suggested.

[0008] When a processing room is made into double structure, this invention tends to materialize carrying in of the substrate to a plasma generating room, and taking out, and tends to attain embodiment of the CVD system of double room structure.

[0009]

[Means for Solving the Problem] connection which this invention prepares inner locus in the processing interior of a room, forms a plasma generating room in the CVD system which established the plasma generating room in the processing interior of a room, and was made into double room structure, and is prepared in the aforementioned processing room at these inner locus -- a hole is made to counter, carrying-in **** is prepared, and it carries out having enabled opening and closing of this carrying-in **** with the shutter as the feature

[0010]

[Function] When carrying out CVD processing of the substrate carried in to the plasma generating interior of a room, carrying-in **** is blockaded with a shutter, the plasma generating room of an abbreviation sealing state is formed, and carrying-in taking out of a substrate is releasing the aforementioned carrying-in **** with the aforementioned shutter, and becomes that carrying-in taking out of a substrate is possible.

[0011]

[Example] Hereafter, one example of this invention is explained, referring to a drawing.

[0012] Drawing 1 is a thing of this CVD system which shows the cross section of a processing room especially at this invention.

[0013] The upper electrode holder 4 is formed in the upper surface of the processing room 1, the guide pipe 5 which penetrates the upper surface of the aforementioned processing room 1 is formed in the center of this upper electrode holder 4, the electrode top plate 6 and the bottom plate 7 of an electrode are formed in the soffit of this guide pipe 5, and the aforementioned guide pipe 5, the electrode top plate 6, and the bottom plate 7 of an electrode are insulated by insulating materials 8, 9, 10, and 11.

[0014] A gap 12 is formed between the aforementioned electrode top plate 6 and the aforementioned bottom plate 7 of an electrode, and this gap 12 and the interior of the aforementioned guide pipe 5 are open for free passage. Moreover, the feed holes 13 of a required number are drilled by the aforementioned bottom plate 7 of an electrode.

[0015] It prepares in the inferior surface of tongue of the above top electrode holder 4 possible [separation of the inner locus 15], and the lower electrode 16 which stands face to face against the aforementioned bottom plate 7 of an electrode focusing on the pars basilaris ossis occipitalis of these inner locus 15 is formed.

[0016] The exhaust air board 17 is formed in accordance with the circumference of this lower electrode 16, and the exhaust air lid 18 made from a quartz is ****(ed) on the upper surface of this exhaust air board 17.

[0017] The exhaust-air slot 39 is formed in the aforementioned exhaust-air board 17 from an upper surface side, this exhaust-air slot 39 is carrying out the shape of zigzag formed from rectilinear-propagation section 39a which goes in the center, snow drift ball section 39b located at the nose of cam of the rectilinear-propagation section, and infestation section 39c linked to the aforementioned rectilinear-propagation section 39a, and the through-hole 40 open for free passage is drilled by the mid gear of this exhaust-air slot 39 in the aforementioned processing room 1.

[0018] The aforementioned exhaust air slot 39 is covered, a zigzag-like exhaust air way is formed, an exhaust port 41 is drilled in the necessary position of this exhaust air lid 18, and the aforementioned exhaust air lid 18 opens the aforementioned exhaust port 41 and the aforementioned exhaust air slot 39 for free passage by ***** 42 formed in the inferior-surface-of-tongue side of this exhaust air lid 18.

[0019] Moreover, the lower electrode covering 19 made from a ***** quartz is laid in this exhaust air lid 18 and the bottom electrode 16 of the above. Alignment of this lower electrode covering 19 is carried out by the pin 20 made from a quartz implanted in the bottom electrode 16 of the above.

[0020] Inside the room 15 within the above, the side-attachment-wall covering 21 made from a quartz is formed, and the one section is made to carry out the polymerization of this side-attachment-wall covering 21 and the bottom electrode covering 19 of the above to it. The upper electrode covering 22 is fallen and formed in the upper-limit level difference section of this side-attachment-wall covering 21, and, as for this upper electrode covering 22 and the aforementioned bottom plate 7 of an electrode, a gap is formed.

[0021] O ring 14 is formed along the upper inner circumference edge of the room 15 within the above, and the seal of between the upper electrode holder 4, the inner locus 15 and the inner locus 15, and the side-attachment-wall coverings 21 is airtightly carried out by making this O ring 14 contact simultaneously the above top electrode holder 4 and the side-attachment-wall covering 21.

[0022] the above top electrode covering 22 -- much distributions -- a hole 23 should be drilled and pass the centrum of the aforementioned guide pipe 5, the aforementioned gap 12, and feed holes 13 by supplying reactant gas from the reactant gas supply pipe 24 formed in the aforementioned guide pipe 5 -- the aforementioned distribution -- reactant gas is uniformly supplied to the plasma generating room 25 from a hole 23. Moreover, the gas in this plasma generating room 25 is discharged in the processing room 1 through the aforementioned exhaust air lid 18 and the exhaust air board 17, and is exhausted from the exhaust port 34 further prepared in the bottom plate 43 of this processing room 1 to this processing room 1.

[0023] It prepares possible [rise and fall of the lower electrode hot plate 26 which contacts the inferior surface of tongue of the bottom electrode 16 of the above], and this lower electrode hot plate 26 is formed in the plinth 27 through the spring 28. Under this lower electrode hot plate 26, a heat-reflecting plate 38 is formed in multiplex, and is carrying out heat insulation to the lower part side of this lower electrode hot plate 26. Moreover, the press pin 29 which contacts the inferior surface of tongue of the room 15 within the above is formed in the aforementioned plinth 27.

[0024] Although especially this plinth 27 is not illustrated, it is supported by the rise-and-fall unit, and this rise-and-fall unit presses the bottom electrode hot plate 26 of the above to the bottom electrode 16 of the above through the aforementioned spring 28 while forcing the room 15 within the above on the above top electrode holder 4 through the aforementioned press pin 29. Furthermore, in the state where it was made to hold in the room 15 within the above, the exhaust air lid 18, the side-attachment-wall covering 21, and the upper electrode covering 22 are supported by the lower electrode hot plate 26, and are dropped. Moreover, a wheel 35 is formed in the room 15 within the above, and these inner locus 15 are ****(ed) on a rail 36 in the state where it descended.

[0025] Carrying-in **** 30 for carrying in and taking out a substrate 2 on the room 15 within the above and the 1 side of the side-attachment-wall covering 21 is formed, and this carrying-in **** 30 is opened and closed by the shutter 32 supported by the parallel link 31, and rotates this shutter 32 with the shutter switchgear 33 mentioned later.

[0026] the connection for combining with the position which counters carrying-in **** 30 of the aforementioned processing room 1 with other units -- a hole 37 prepares -- having -- **** -- this connection -- the robot arm (not shown) of a conveyance machine goes in and out through a hole 37 this connection -- a hole 37 is opened and closed by the gate valve which is not illustrated

[0027] It **, in the state of open, a substrate 2 is carried in to the plasma generating room 25, and the aforementioned shutter 32 is laid in the bottom electrode 16 of the above, and further, supplying reactant gas to the plasma generating room 25 from the reactant gas supply pipe 24, in the state of drawing 1 in which the shutter 32 blockaded aforementioned carrying-in **** 30, plasma is generated between the aforementioned bottom plate 7 of an electrode, and the lower electrode 16, and membranes are formed on the aforementioned substrate 2.

[0028] If membrane formation is completed, opening of aforementioned carrying-in **** 30 will be carried out with the aforementioned shutter switchgear 33, and a substrate 2 will be taken out from this CVD system with the conveyance machine

which is not illustration.

[0029] Next, the shutter switchgear 33 is explained.

[0030] As described above, it has prepared in the room 15 within the above through the parallel link 31 at the shutter 32, and the engagement slot 44 which penetrates this shutter 32 horizontally is engraved, and the soffit of a shutter 32 serves as a taper configuration further.

[0031] The seal block 45 is installed by the aforementioned bottom plate 43, the bearing block 48 fixes in the upper surface of this bottom plate 43, and while a lift rod 46 is formed in this seal block 45 free [airtight *****], this lift rod 46 is penetrated free [sliding of the aforementioned bearing block 48]. The shutter opening-and-closing cylinder 47 is connected with the soffit of this lift rod 46, and the press board 49 fixes to the upper limit of the aforementioned lift rod 46. Moreover, the guide rod 50 prolonged caudad was formed in this press board 49, and this guide rod 50 has fitted into it free [sliding] at the aforementioned bearing block 48.

[0032] The engagement child 52 is formed in the upper surface side of the aforementioned press board 49 free [rise and fall to the press board 49] through a slide pin 51, and the **** engagement child 52 is caudad energized with the spring 55. The engagement pin 53 is prepared for this engagement child 52 one pair of right and left, and this engagement pin 53 fits loosely into the aforementioned engagement slot 44.

[0033] The shutter press roller 54 is formed in the aforementioned press board 49 in a necessary pitch (this example four pieces), and this shutter press roller 54 can contact the taper section of the shutter 32 aforementioned soffit.

[0034] Hereafter, the operation of the shutter switchgear 33 is explained.

[0035] In order to show the state where the shutter 32 is closed and to release a shutter 32 from this synizesis state, drawing 2 - drawing 4 drive the aforementioned shutter opening-and-closing cylinder 47, and drop the aforementioned press board 49 through the aforementioned lift rod 46. Although the aforementioned shutter 32 may be stuck to the room 15 within the above, the aforementioned engagement-pin 53 which fitted loosely into the aforementioned engagement slot 44 reduces the aforementioned shutter 32. In this case, since it reduces through the engagement pin 53 to this shutter 32 and the force acts, too much force acts and is not damaged.

[0036] Lock out of a shutter 32 drives the aforementioned shutter opening-and-closing cylinder 47, and should just raise the aforementioned press board 49. Through the aforementioned shutter press roller 54, the aforementioned shutter 32 is pushed up and this shutter 32 seals carrying-in **** 30 of the room 15 within the above. After the aforementioned shutter 32 seals carrying-in **** 30, the aforementioned shutter opening-and-closing cylinder 47 demonstrates necessary climbing power, makes the inner locus 15 press the aforementioned shutter 32 equally by two or more places through the aforementioned shutter press roller 54, and makes perfect sealing of aforementioned carrying-in **** 30.

[0037] It ** and carrying-in taking out of this substrate 2 required for processing of the substrate 2 in the aforementioned plasma generating room 25 is attained by opening and closing of aforementioned carrying-in **** 30 by the aforementioned shutter switchgear 33.

[0038] Although it mentioned above the room 15 within the above descending and ****(ing) on the aforementioned rail 36 These inner locus 15 can be further pulled out now along with the aforementioned rail 36 in the carrying-in taking-out direction and the right-angled direction of the aforementioned substrate 2 because of cleaning. On the occasion of horizontal movement of the room 15 within the above, the aforementioned engagement pin 53 moves in the inside of the aforementioned engagement slot 44. When the engagement to the aforementioned shutter 32 and the aforementioned shutter switchgear 33 is canceled easily and the room 15 within the above is similarly inserted in after cleaning, engagement to a shutter 32 and the shutter switchgear 33 is made certainly.

[0039] In addition, although opening and closing of aforementioned carrying-in **** 30 are performed by various meanses and the aforementioned shutter 32 was supported by the parallel link 31, the guide slot of the vertical direction is established in the inner locus 15 side, and you may make it a shutter 32 go up and down along this guide slot. Furthermore, other shutter switchgears are explained in drawing 7 . In addition, the same sign is given to the same thing as what was shown in drawing 1 - drawing 4 among drawing 7 .

[0040] In this example, a shutter 32 is fixed to a lift rod 46, you make it go up and down this shutter 32 directly, and carrying-in **** 30 is opened in the shutter opening-and-closing cylinder 47 and closed.

[0041]

[Effect of the Invention] As stated above, when according to this invention a plasma generating room is established in the processing interior of a room and it considers as double room structure, carrying-in taking out of the substrate to this plasma generating room is enabled, and it contributes to realization-ization of the CVD system of double room structure.

[Translation done.]